2 nanometers gives MR ratio peak. In experiences, when the total thickness of the free layer and the nonmagnetic high-conductivity layer of Cu falls between 4 and 5 nanometers or so, the high-conductivity layer gives MR ratio peak. Therefore, it is desirable that the thickness of the nonmagnetic high-conductivity layer is defined around the range. Where the nonmagnetic high-conductivity layer is of Cu, being adjacent to the free layer, the preferred range of the total thickness of the Cu layer and the free layer falls between 3 nanometers and 5.5 nanometers or so including the margin.

Next referred to is Hpin. For reducing Hpin, it is desirable that the effective thickness of the pinned layer of CoFe with Bs being 1.8T is at most around 2 nanometers (at most around 3.6 nanometers in terms of NiFe), more preferably at most 1.7 nanometer (at most 3 nanometers in terms of NiFe), and most preferably at most 1 nanometer (at most 1.8 nanometers in terms of NiFe). For realizing the preferred condition, it is desirable that the pinned layer has a Synthetic AF structure. For example, the structure is composed of antiferromagnetic film/ferromagnetic film 1/0.9 nm Ru/ferromagnetic film 2, in which the ferromagnetic film 1 is antiferromagnetically coupled to the ferromagnetic film 2. One of the two ferromagnetic layer, the ferromagnetic film 1 as antiferromagnetically coupled to the other is magnetically

pinned in one direction by the antiferromagnetic film. The magnetization directions of the ferromagnetic film 1 and the ferromagnetic film 2 are opposite to each other, and the coupling magnetic field between them is several kOe and is large. Therefore, as primary approximation, it is considered that the difference between Ms×t of the ferromagnetic film 1 and that of the ferromagnetic film 2 would contribute to the effective pinned layer stray magnetic field (USP No. 5,465,185).

For example, in the preferred constitution of IrMn/2 nm CoFe/0.9 nm Ru/2.5 nm CoFe, the effective thickness of the pinned layer will be 2.5 nanometers - 2 nanometers = 0.5 nanometers (the magnetic thickness will be 0.9 nanometer Tesla). Reducing the effective pinned layer thickness, if possible, brings about the reduction in Hpin, as in the formula (1-4). When the pinned layer of low Mst is realized by normal pinned structure, it is able to obtain the good bias point without synthetic AF structure.

Next referred to is Hin. From the viewpoint of the bias point and the spin filter effect, it is desirable the thickness of the Cu layer as the spacer is as small as possible, as so mentioned hereinabove. Concretely, it is desirable that, with such a thin spacer film, Hin falls between 0 and 20 Oe or so, more preferably between 5 and 15 Oe or so. In the invention, one resolution for the film constitution not increasing Hin even when the spacer is thin is a two-layered underlayer

constitution or the like.

Next referred to is the thermal stability for MR ratio. When ultra-thin free layers are employed, it is extremely difficult to maintain good thermal stability for MR ratio in thermal treatment. Concretely, two measures may be taken for improving the thermal stability for MR ratio of spin valve films incorporating an ultra-thin free layer. One is to provide a nonmagnetic high-conductivity layer of a certain level, adjacent to the free layer. Needless-to-say, the nonmagnetic high-conductivity layer exhibits the spin filter effect. In addition, it has been found that the layer further acts to improve the thermal stability for MR ratio. It has been found that, though not so significant when the thickness of the neighboring free layer is around 4.5 nanometers, the total thickness of the free layer and the nonmagnetic high-conductivity layer must be indispensably at least 1 nanometer when the free layer is thinned to be around 2 nanometers. For example, when the nonmagnetic high-conductivity layer thickness is 0 nanometer, the MR ratio after thermal treatment (at 270°C for 10 hours) will reduce by about 50 % in terms of the relative ratio based on the MR ratio in the as-deposited condition. However, if the nonmagnetic high-conductivity layer of around 1 nanometer in thickness is provided, the MR ratio reduction is decreased to fall between 0 and 30 %.

Even the first measure being taken, the thermal